

Appendix J

Supplemental Information on Water Resource Issues

Letter from Robinson & Noble to Roy Elliot, January 27, 2000

Exhibit A from David Davidson's Written Comments on the Sumas Energy 2 Draft EIS
(Includes Letter from City of Abbotsford and Abbotsford Abandoned Wells Flow Rates)

January 27, 2000

Mr. Roy Elliot
Dames & Moore
500 Market Place Tower
2025 1st Ave
Seattle, WA 98121

Subject: Theoretical radii of potential interference at the Sumas Wellfields

Dear Roy:

As a result of our meeting with Jones & Stokes on January 20, Robinson & Noble was requested to define a theoretical radius of influence for each of the City of Sumas Wellfields. We were asked to identify the distance at which one foot of interference drawdown occurs as a result of production of the full allocated water right at each wellfield. The results were then to be compared to local well and water right locations in order to identify any potential water rights concerns. The following describes our methodology and results. Attached is a figure illustrating the defined areas of influence and the near-by wells and water rights (Figure 1).

The amount of drawdown a pumping well causes is a function of aquifer transmissivity, aquifer storativity, and time. Standard methods of predicting drawdown, like those used herein, assume homogeneous transmissivity and storativity conditions throughout an aquifer. However, pump test results for the two wellfields show that aquifer conditions are not homogenous.

Therefore, in order to create proper definitions of radius of potential influence, we identified implied low and high values for the transmissivity (T) at each wellfield. These transmissivity values were based on test data for the major production wells at each field as shown below.

Table 1: Transmissivity Ranges at Sumas Wellfields (gpd/ft)

	May Road (Well 3 seven-day test)	Sumas City Wellfield (Wells 4R and 5 four-hour tests)
Low T	46,500	120,000
High T	247,000	275,000

Using the Theis non-equilibrium equations, we identified amounts of drawdown at various distances from each wellfield pumping center for each given T value. In addition to the Theis assumptions, each calculation assumed that the wellfield was producing its full allotted instantaneous water right quantity: 1,660 gallons per minute (gpm) at May Road and 2,250 gpm at the City wellfield. The defined drawdown values established a distance-drawdown curve from

which a distance could be identified representing one foot of drawdown. For each T, the defined distance was used as the radius of a circle around the pumping center (see Figure 1). This process was then double-checked using a spreadsheet calculation to solve for the radius resulting from one foot of interference drawdown.

The May Road calculation was based on values from the 7-day testing performed in 1992. This test provided a time value (t) of 5.8 days and a storativity (S) of 0.06 to apply to the Theis equations. The City wellfield calculations were based on the tests of Wells 4R and 5, providing a t of 0.16 days and an S of 0.0002. The results of the calculations at the May Road site were compared to measured data from the 7-day test collected at the same time value (t=5.8 days). Accounting for the changes in discharge rates, the theoretical values agree reasonably well with noted data. (No observation well data at distance was available for the City wellfield during the testing of Wells 4R and 5.)

The short time-frame utilized in the calculations at the City wellfield was an initial concern. However, it was noted that many of the Theis assumptions were already violated at the conditions defined by this short timeframe. For example, both the low and high-T circles defined for the City wellfield encompass the May Road Wellfield, thus indicating that influence effects of greater than one foot should be evident in the May Road Wells. However, the available water level records do not indicate any interference effects at the May Road Wells resulting from production at the City wellfield. This is likely due to the change in storativity from the City wellfield (S = 0.0002) to May Road (S = 0.06). Larger storage values result in smaller diameter drawdown cones. Thus, during the pumping of the City wellfield, the drawdown cone stops rapid spreading when it reaches the higher storativity area of the aquifer, resulting in no interference being seen at May Road. Therefore, the radii presented for the City wellfield are probably conservatively large, even with the small time value used.

David Davidson provided mapped locations of single-family domestic wells near the May Road Wellfield. (City services are available near the City wellfield.) We added relevant water right locations around both wellfields based on a water rights investigation performed in 1992. (An updated water rights list was requested from Ecology, but was not available at the time of writing.) The well and water right locations are plotted on Figure 1. Within the defined areas of influence, the only water right found was the irrigation right for the Tolsma family (G1-23636). Three single-family domestic wells were noted within the influence radii of the May Road wellfield and a fourth was located on the edge of the outer circle. The same wells, plus several others further to the southwest, are within the indicated area for the City wellfield. However, as noted above, these wells will likely see little or no interference from the City wellfield (similar to the May Road Wells) because they are in an area of higher storativity than used for the theoretical area of influence calculation.

We hope that this information meets your needs. However, please note that these theoretical influence circles were defined to meet this specific request, and it would be inappropriate to apply these calculations to unrelated hydrogeologic applications. More specific estimates of

Mr. Roy Elliot
Dames & Moore
January 27, 2000
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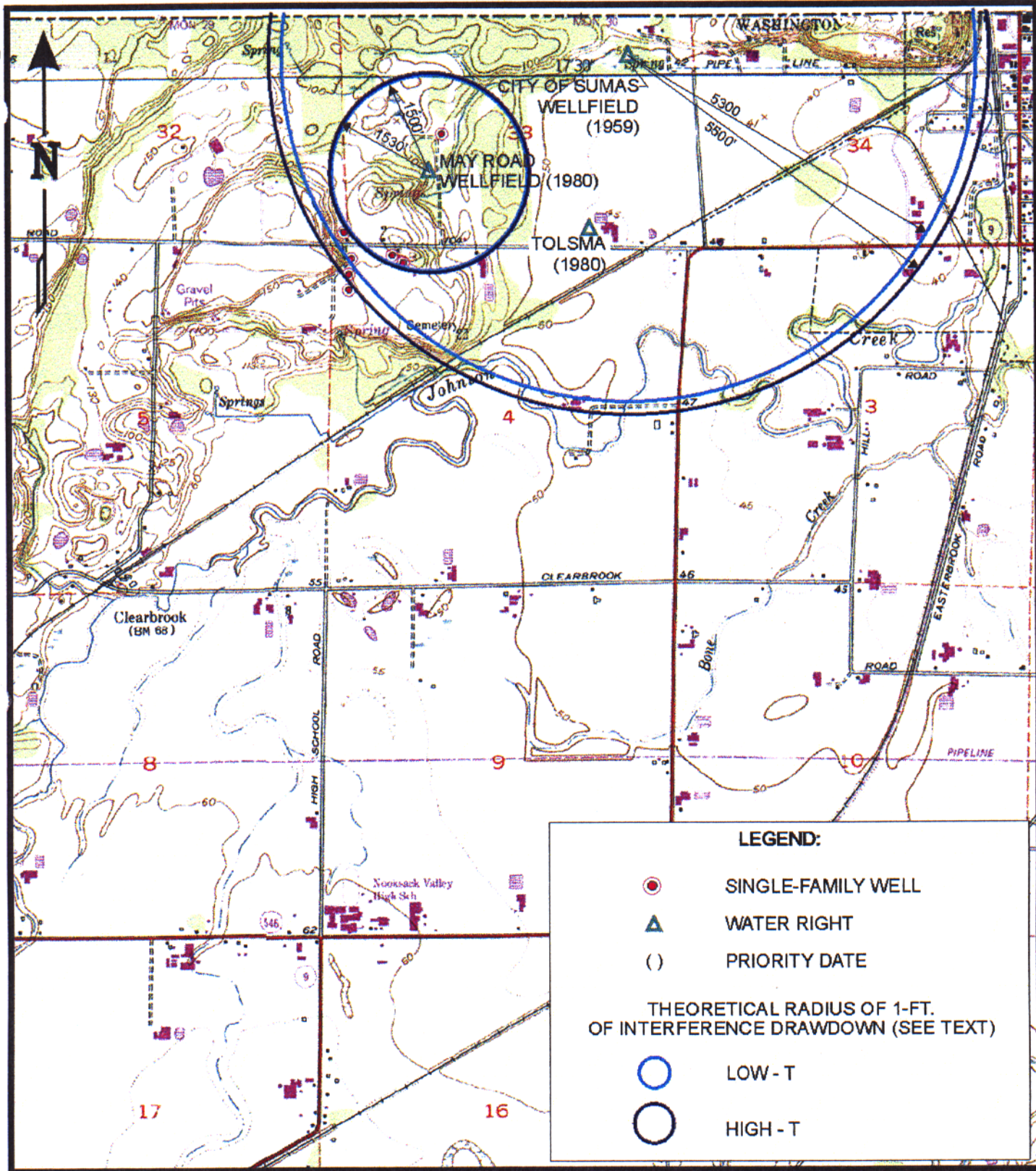
predicted drawdowns than given here will likely require the use of numerical modeling. Measurements of the identified wells are recommended during the next phase of well drilling and testing. Please contact us if you need anything further.

Sincerely,
Robinson & Noble, Inc.

ORIGINAL SIGNED BY

Burt G. Clothier
Project Hydrogeologist

attachment



Source: Robinson & Noble, Inc., base map taken from USGS Sumas quadrangle.

Figure 3.2-4

THEORETICAL RADIUS OF INTERFERENCE MAY RD. AND CITY OF SUMAS WELLFIELDS



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CITY OF
Abbotsford

Exhibit A

2000-02-25
File: 5600-40
X File: 5260-50/7

City of Sumas
433 Cherry Street
Sumas, WA
USA 98295

Attention: Mr. David Davidson

Dear Sirs:

Re: Abbotsford East Wells

Further to our telephone conversation on February 24, 2000 this will confirm that the City of Abbotsford is currently implementing it's plan to minimize well water usage in East Abbotsford (former District of Abbotsford). During the next few months the water system will be changed such that the existing wells will only be used for peak demands during the summer months. As time progresses it is the intent to further reduce usage of the well water with plans to develop additional surface water supplies in the 10 to 15 year time frame. The wells referred to include the Farmer Road and Industrials wells.

Should you have any questions please call me at (604)864-5514.

Yours truly,

Rick Bomhof, P.Eng.
Manager, Utilities

RB:m

Exhibit A (cont.)

ABBOTSFORD ABANDONED WELLS FLOW RATES

FARMER RD. WELLS

#1 1,400 GPM
#2 1,000 GPM
#3 800 GPM

TOTAL 3,200 GPM

INDUSTRIAL WELLS

A. 400 GPM
B 680 GPM
C 1,000 GPM

TOTAL 2,080 GPM

GRAND TOTAL 5,280 GALLONS PER MIN.

These flow rates
provided to Rod Fadden
(Sumas Utilities Superintendent)
by Len Stein
(Abbotsford utilities
operations manager)
in March, 2000

